WHAT IS CLAIMED IS

1. An apparatus for detecting a presence, determining a location, and quantifying an amount of at least a chemical species, said apparatus comprising:

(1) a capillary having a wall that is permeable to said at least one chemical species;

(2) a means for delivering at least one fluid medium into a space inside said capillary; and

(3) a means for transferring a content of said capillary to a detector for detecting said at least one chemical species, said content comprising said fluid medium and said at least one chemical species.

2. The apparatus according to claim 1, wherein said detector is selected from the group consisting of detectors employing at least one method of detection selected from the group consisting of optical, spectroscopic, electrochemical, gravimetric, and mass spectrometric method.

3. The apparatus according to claim 2, wherein said optical method is selected from the group consisting of refractive index measurement and light scattering.

4. The apparatus according to claim 2, wherein said spectroscopic method is selected from the group consisting of measurements of UV-VIS electronic absorbance, Raman spectra, luminescence spectra, infrared spectra, and near-infrared spectra.

5. An apparatus for detecting a presence, determining a location, and quantifying an amount of at least a chemical species, said apparatus comprising:

(1) a capillary having a wall that is permeable to said at least one chemical species;

(2) a means for delivering at least one fluid medium comprising at least one reagent into a space inside said capillary, said at least one reagent being capable of undergoing a selective interaction with said chemical species to yield at least one optically detectable interaction product; and

(3) a means for transferring a content of said capillary to a detector for detecting said at least one optically detectable interaction product, thereby detecting

said at least one chemical species, said content comprising said at least one optically detectable interaction product.

6. The apparatus according to claim 5, wherein said detector is capable of quantitatively relating an optical signal resulting from a presence of said at least one optically detectable reaction product to said amount of said chemical species outside said capillary.

7. The apparatus according to claim 6, wherein said optical signal is selected from the group consisting of absorbance and intensity of emission of electromagnetic ("EM") radiation having a wavelength in a range from about 100 nm to about 1 mm.

8. The apparatus according to claim 5, wherein said capillary comprises a polymeric material selected from the group consisting of expanded polytetrafluoroethylene ("PTFE"), poly(vinyl chloride) ("PVC"), poly(vinyl alcohol) ("PVA"), polyurethane, polyolefins, polycarbonate, polystyrene, polyamide, poly(vinylidene fluoride) ("PVDF"), polyarylsuphones, polyacrylonitrile, polyether, poly(ether thioether), poly(methyl methacrylate), polyvinylpyrrolidone, polysiloxane, copolymer of perfluorosulfonic acid and polytetrafluoroethylene, random copolymer of tetrafluoroethylene and perfluoro-2,2-dimethyl-1,3-dioxole, copolymers thereof, and blends thereof.

9. The apparatus according to claim 5, wherein said capillary comprises a polymeric material deposited on a porous solid substrate; said polymeric material being selected from the group consisting of expanded polytetrafluoroethylene ("PTFE"), poly(vinyl chloride) ("PVC"), poly(vinyl alcohol) ("PVA"), polyurethane, polyolefins, polycarbonate, polystyrene, polyamide, poly(vinylidene fluoride) ("PVDF"), polyarylsuphones, polyacrylonitrile, polyether, poly(ether thioether), poly(methyl methacrylate), polyvinylpyrrolidone, polysiloxane, copolymer of perfluorosulfonic acid and polytetrafluoroethylene, random copolymer of tetrafluoroethylene and perfluoro-2,2-dimethyl-1,3-dioxole, copolymers thereof, and blends thereof.

10. The apparatus according to claim 9, wherein said porous solid substrate is a porous glass capillary.

11. The apparatus according to claim 8, wherein said capillary is porous and has pore size in a range from about 1 nm to about 200 nm.

12. The apparatus according to claim 11, wherein said capillary preferably has pore size in a range from about 1 nm to about 50 nm.

13. The apparatus according to claim 8, wherein said capillary has an inner diameter in a range from about 2 micrometers to about 2 mm.

14. The apparatus according to claim 13, wherein said inner diameter is preferably in a range from about 0.1 mm to about 1.5 mm.

15. The apparatus according to claim 8, wherein said capillary has a wall thickness in a range from about 10 micrometers to about 200 micrometers.

16. The apparatus according to claim 15, wherein said wall thickness is preferably in a range from about 10 micrometers to about 150 micrometers.

17. The apparatus according to claim 5, wherein said chemical species is selected from the group consisting of halogenated hydrocarbons, polynitroaromatic hydrocarbons, mono-substituted benzene, aromatic aldehydes, aromatic amines, and mixtures thereof.

18. The apparatus according to claim 17, wherein said halogenated hydrocarbons are trichloroethylene, trichloroethane, chloroform, bromoform, chlorodibromomethane, and bromodichloromethane.

19. The apparatus according to claim 17, wherein said polynitroaromatic hydrocarbons are 1,3,5-trinitrobenzene; 2,4,6-trinitrobiphenyl; 2,3',4,5',6-pentanitrobiphenyl; 2,2',4,4',6,6'-hexanitrobiphenyl; 2,4,6-trinitrotoluene; 2,2',4,4',6,6'-hexatrinitrobiphenyl; 2,2',4,4',6,6'-hexanitrostilbene; 2,2'4,4'-tetranitrobiphenyl; 3,3',5,5'-tetranitrobiphenyl; 2,2',6,6'-tetranitrobiphenyl; 1,4,5,8-tetranitronaphthalene; 1,3-dinitrobenzene; 2-ethoxy-1,3,5-trinitrobenzene; 2-methyl-1,3-dinitrobenzne; 2,4-dimethyl-1,3-dinitrobenzne; and mixtures thereof.

20. The apparatus according to claim 17, wherein said mono-substituted benzene has a formula of Ar-X, wherein Ar is a phenyl radical and X is a radical selected from the group consisting of $-CH_3$, $-OCH_3$, $-C_6H_5$, $-SCH_3$, and $-SC_6H_5$.

21. The apparatus according to claim 17, wherein said aromatic aldehydes are benzaldehyde, 1-naphthaldehyde, 9-anthraldehyde, 4-dimethylaminocinnamaldehyde, 2-nitrobenzaldehyde, and 4-nitrobenzaldehyde.

22. The apparatus according to claim 17, wherein said aromatic amines are pyridine and alkyl-substituted pyridines.

23. An apparatus for detecting a presence, determining a location, and quantifying an amount of at least a chemical species, said apparatus comprising:

(1) a capillary having a wall that is permeable to said at least one chemical species;

(2) a means for delivering at least one fluid medium comprising at least one reagent into a space inside said capillary, said at least one reagent being capable of undergoing a selective interaction with said chemical species to yield at least one optically detectable interaction product; and

(3) a means for transferring a content of said capillary to a detector for detecting said at least one optically detectable interaction product, thereby detecting said at least one chemical species, said content comprising said at least one optically detectable interaction product;

wherein said capillary comprises a polymeric material selected from the group consisting of expanded polytetrafluoroethylene ("PTFE"), poly(vinyl chloride) ("PVC"), poly(vinyl alcohol) ("PVA"), polyurethane, polyolefins, polycarbonate, polystyrene, polyamide, poly(vinylidene fluoride) ("PVDF"), polyarylsuphones, polyacrylonitrile, polyether, poly(ether thioether), poly(methyl methacrylate), polyvinylpyrrolidone, polysiloxane, copolymer of perfluorosulfonic acid and polytetrafluoroethylene, random copolymer of tetrafluoroethylene and perfluoro-2,2-dimethyl-1,3-dioxole, copolymers thereof, and blends thereof; said detector is capable of quantitatively relating an optical signal resulting from a presence and an amount of said at least one optically detectable reaction product to said presence and said amount of said chemical species outside said capillary; and said optical signal is selected from the group consisting of absorbance and emission of EM radiation having a wavelength in a range from about 100 nm to about 1 mm.

24. The apparatus according to claim 5, wherein said chemical species is selected from the group consisting of halogenated hydrocarbons, polynitroaromatic hydrocarbons, mono-substituted benzene, aromatic aldehydes, aromatic amines, and mixtures thereof.

25. A method for detecting a presence, determining a location, and quantifying an amount of at least a chemical species, said method comprising:

(1) providing a capillary having two opposed ends and a wall that is permeable to said at least one chemical species at a location where said chemical species is suspected to be present;

(2) delivering at least one fluid medium into a space inside said capillary;

(3) providing at least one detector having a sensing element for detecting said at least one characteristic of said at least one chemical species;

(4) allowing said chemical species to permeate through said wall of said capillary;

(5) transferring a content of said capillary to said sensing element of said detector after a permeation of said at least one chemical species into said capillary, said content comprising said fluid medium and said at least one chemical species;

(6) detecting and measuring a magnitude of said characteristic of said at least one chemical species;

(7) measuring a time at which said characteristic is detected and measured; and

(8) relating said magnitude of said characteristic to said amount of said chemical species and relating said time to said location of said chemical species.

26. The method according to claim 25, wherein said detector employs a method of detection selected from the group consisting of optical, spectroscopic, electrochemical, gravimetric, and mass spectrometric methods.

27. The method according to claim 26, wherein said optical method is selected from the group consisting of refractive index measurement and light scattering.

28. The method according to claim 26, wherein said spectroscopic method is selected from the group consisting of measurements of UV-VIS electronic absorbance, Raman spectra, luminescence spectra, infrared spectra, and near-infrared spectra.

29. A method for detecting a presence, determining a location, and quantifying an amount of at least a chemical species, said method comprising:

(1) providing a capillary having two opposed ends and a wall that is permeable to said at least one chemical species at a location where said chemical species is suspected to be present;

(2) delivering at least one fluid medium comprising at least one reagent into a space inside said capillary, said at least one reagent being capable of undergoing a selective interaction with said chemical species to yield at least one optically detectable interaction product;

(3) providing at least one detector having a sensing element for detecting said at least one optically detectable interaction product;

(4) allowing said chemical species to permeate through said wall of said capillary and selectively interact with said reagent to yield said at least one optically detectable product;

(5) transferring, after said selective interaction, a content of said capillary to said sensing element of said detector, said content comprising said at least one optically detectable interaction product;

(6) detecting and measuring a magnitude of an optical signal resulting from a presence of said at least one optically detectable product;

(7) measuring a time at which said optical signal is detected and measured; and

(8) relating said magnitude of said optical signal to said amount of said chemical species and relating said time to said location of said chemical species.

30. The method according to claim 29, wherein said optical signal is selected from the group consisting of absorbance and intensity of emission of EM radiation having a wavelength in a range from about 100 nm to about 1 mm.

31. The method according to claim 29, wherein said capillary comprises a polymeric material selected from the group consisting of expanded polytetrafluoroethylene ("PTFE"), poly(vinyl chloride) ("PVC"), poly(vinyl alcohol) ("PVA"), polyurethane, polyolefins, polycarbonate, polystyrene, polyamide, poly(vinylidene fluoride) ("PVDF"), polyarylsuphones, polyacrylonitrile, polyether, poly(ether thioether), poly(methyl methacrylate), polyvinylpyrrolidone, polysiloxane, copolymer of perfluorosulfonic acid and polytetrafluoroethylene, random copolymer of tetrafluoroethylene and perfluoro-2,2-dimethyl-1,3-dioxole, copolymer of perfluorosulfonic acid and polytetrafluoroethylene, random copolymer of tetrafluoroethylene and perfluoro-2,2-dimethyl-1,3-dioxole, copolymers thereof, and blends thereof.

32. The method according to claim 29, wherein said capillary comprises a polymeric material deposited on a porous solid substrate; said polymeric material being selected from the group consisting of expanded polytetrafluoroethylene ("PTFE"), poly(vinyl chloride) ("PVC"), poly(vinyl alcohol) ("PVA"), polyurethane, polyolefins, polycarbonate, polystyrene, polyamide, poly(vinylidene fluoride) ("PVDF"), polyarylsuphones, polyacrylonitrile, polyether, poly(ether thioether), poly(methyl methacrylate), polyvinylpyrrolidone, polysiloxane, copolymer of perfluorosulfonic acid and polytetrafluoroethylene, random copolymer of tetrafluoroethylene and perfluoro-2,2-dimethyl-1,3-dioxole, copolymer of perfluorosulfonic acid and polytetrafluoroethylene, random copolymer of tetrafluoroethylene and perfluoro-2,2-dimethyl-1,3-dioxole, copolymers thereof, and blends thereof.

33. The method according to claim 32, wherein said porous solid substrate is a porous glass capillary.

34. The method according to claim 31, wherein said capillary is porous and has pore size in a range from about 1 nm to about 200 nm.

35. The method according to claim 34, wherein said capillary preferably has pore size in a range from about 1 nm to about 50 nm.

36. The method according to claim 31, wherein said capillary has an inner diameter in a range from about 2 micrometers to about 2 mm.

37. The method according to claim 31, wherein said inner diameter is preferably in a range from about 0.1 mm to about 1.5 mm.

38. The method according to claim 31, wherein said capillary has a wall thickness in a range from about 10 micrometers to about 200 micrometers.

39. The method according to claim 38, wherein said wall thickness is preferably in a range from about 10 micrometers to about 150 micrometers.

40. The method according to claim 29, wherein said chemical species is selected from the group consisting of halogenated hydrocarbons, polynitroaromatic hydrocarbons, mono-substituted benzene, aromatic aldehydes, aromatic amines, and mixtures thereof.

41. The method according to claim 40, wherein said halogenated hydrocarbons are trichloroethylene, trichloroethane, chloroform, bromoform, chlorodibromomethane, and bromodichloromethane.

42. The method according to claim 40, wherein said polynitroaromatic hydrocarbons are 1,3,5-trinitrobenzene; 2,4,6-trinitrobiphenyl; 2,3',4,5',6-pentanitrobiphenyl; 2,2',4,4',6,6'-hexanitrobiphenyl; 2,4,6-trinitrotoluene; 2,2',4,4',6,6'-hexatrinitrobiphenyl; 2,2',4,4',6,6'-hexanitrostilbene; 2,2'4,4'-tetranitrobiphenyl; 3,3',5,5'-tetranitrobiphenyl; 2,2',6,6'-tetranitrobiphenyl; 1,4,5,8-tetranitronaphthalene; 1,3-dinitrobenzene; 2-ethoxy-1,3,5-trinitrobenzene; 2-methyl-1,3-dinitrobenzne; 2,4-dimethyl-1,3-dinitrobenzne; and mixtures thereof.

43. The method according to claim 40, wherein said mono-substituted benzene has a formula of Ar-X, wherein Ar is a phenyl radical and X is a radical selected from the group consisting of $-CH_3$, $-OCH_3$, $-C_6H_5$, $-SCH_3$, and $-SC_6H_5$.

44. The method according to claim 40, wherein said aromatic aldehydes are benzaldehyde, 1-naphthaldehyde, 9-anthraldehyde, 4-dimethylaminocinnamaldehyde, 2-nitrobenzaldehyde, and 4-nitrobenzaldehyde.

45. The method according to claim 40, wherein said aromatic amines are pyridine and alkyl-substituted pyridine.

46. A method for detecting a presence, determining a location, and quantifying an amount of at least a chemical species, said method comprising:

(1) providing a capillary having two opposed ends and a wall that is permeable to said at least one chemical species at a location where said chemical species is suspected to be present;

(2) delivering at least one fluid medium comprising at least one reagent into a space inside said capillary, said at least one reagent being capable of undergoing a selective interaction with said chemical species to yield at least one optically detectable interaction product;

(3) providing at least one detector having a sensing element for detecting said at least one optically detectable interaction product;

(4) allowing said chemical species to permeate through said wall of said capillary and react with said reagent to yield said at least one optically detectable interaction product;

(5) transferring, after said reaction, a content of said capillary to said sensing element of said detector, said content comprising said at least one optically detectable interaction product;

(6) detecting and measuring a magnitude of an optical signal resulting from a presence of said at least one optically detectable interaction product;

(7) measuring a time at which said optical signal is detected and measured; and

(8) relating said magnitude of said optical signal to said amount of said chemical species and relating said time to said location of said chemical species;

wherein said capillary comprises a polymeric material selected from the group consisting of expanded polytetrafluoroethylene ("PTFE"), poly(vinyl chloride) ("PVC"), poly(vinyl alcohol) ("PVA"), polyurethane, polyolefins, polycarbonate, polystyrene, polyamide, poly(vinylidene fluoride) ("PVDF"), polyarylsuphones, polyacrylonitrile, polyether, poly(ether thioether), poly(methyl methacrylate), polyvinylpyrrolidone, polysiloxane, copolymer of perfluorosulfonic acid and polytetrafluoroethylene, random copolymer of tetrafluoroethylene and perfluoro-2,2-dimethyl-1,3-dioxole, copolymers thereof, and blends thereof; said detector is capable of quantitatively relating an optical signal resulting from a presence and an amount of said at least one optically detectable reaction product to said presence and said amount of said chemical species outside said capillary; and said optical signal is selected from the group consisting of absorbance and emission of EM radiation having a wavelength in a range from about 100 nm to about 1 mm.

47. The method according to claim 46, wherein said chemical species is selected from the group consisting of halogenated hydrocarbons, polynitroaromatic hydrocarbons, mono-substituted benzene, aromatic aldehydes, aromatic amines, and mixtures thereof.

48. The method according to claim 29, wherein the method is used to detect a presence, to determine a location or distribution, and to quantify an amount of said chemical species in an environment.

49. The method according to claim 48, wherein said environment is soil at a range of underground depths.

50. The method according to claim 29, wherein the method is used to detect a presence and to quantify products of a chemical synthesis that is conducted in a combinatorial chemistry experiment.